WHAT IS CLAIMED IS:

1. An electropolishing pad adapted for thinning a layer on a substrate without damaging a delicate underlying layer in the substrate, the electropolishing pad comprising:

a pad formed of an electrically conductive material for applying a desired voltage potential through the electropolishing pad to electrolytically erode the layer on the substrate, and

an operating surface on the pad adapted for physically eroding the layer on the substrate, the operating surface having a roughness that is not so great as to create friction sufficient to induce a shearing force that damages the delicate underlying layer in the substrate, but great enough so as to physically erode the layer on the substrate.

2. The electropolishing pad of claim 1, wherein the substrate is a semiconducting substrate including integrated circuits.

3. The electropolishing pad of claim 1, wherein the layer comprises a first electrically conductive layer, an underlying non electrically conductive barrier layer, and an intervening electrically conductive seed layer.

4. The electropolishing pad of claim 1, wherein the layer comprises copper.

5. The electropolishing pad of claim 1, wherein the electropolishing pad has a diameter that is smaller than a diameter of the substrate.

6. The electropolishing pad of claim 1, wherein the desire voltage potential has a range of between about one tenth of one volt and about one hundred volts.

7. A method for thinning a layer on a substrate without damaging a delicate layer underlying the layer to be thinned, the method comprising the step of forcing an electropolishing pad against the layer on the substrate while applying a desired voltage potential through an electrolyte solution between the substrate and the electropolishing pad, where the layer is thinned both physically by the

electropolishing pad and electrolytically by the voltage potential applied through the electrolyte solution.

8. The method of claim 7, wherein the electrolyte solution is an abrasive electrolyte solution.

9. The method of claim 7, wherein the substrate is a semiconducting substrate including integrated circuits.

10. The method of claim 7, wherein the layer comprises a first electrically conductive layer, an underlying non electrically conductive barrier layer, and an intervening electrically conductive seed layer.

11. The method of claim 7, wherein the layer comprises copper.

12. The method of claim 7, wherein the desired voltage potential has a range of between about one tenth of one volt and about one hundred volts.

13. The method of claim 7, wherein the electropolishing pad has a diameter that is smaller than a diameter of the substrate.

14. The method of claim 7, wherein at least one of the electropolishing pad and the substrate are moved relative to the other.

15. The method of claim 7, wherein both the electropolishing pad and the substrate are moved relative to the other.

16. An electropolishing pad adapted for thinning a layer on a semiconducting substrate having integrated circuits, without damaging a delicate underlying layer of a low k material in the substrate, the electropolishing pad comprising:

a pad formed of an electrically conductive material for applying a desired voltage potential through the electropolishing pad to electrolytically erode the layer on the substrate, and

an operating surface on the pad adapted for physically eroding the layer on the substrate, the operating surface having a roughness that is not so great as

to create friction sufficient to induce a shearing force that damages the delicate underlying layer in the substrate, but great enough so as to physically erode the layer on the substrate.

17. The electropolishing pad of claim 16, wherein the layer comprises a first electrically conductive layer, an underlying non electrically conductive barrier layer, and an intervening electrically conductive seed layer.

18. The electropolishing pad of claim 16, wherein the layer comprises copper.

19. The electropolishing pad of claim 16, wherein the electropolishing pad has a diameter that is smaller than a diameter of the substrate.

20. The electropolishing pad of claim 16, wherein the desire voltage potential has a range of between about one tenth of one volt and about one hundred volts.